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Management Accounting and Capacity Management

– Some implications from cost management and measurement –

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INTRODUCTION

Capacity cost is defined that fixed costs of being able to achieve a desired level of production or to provide a desired level of service while maintaining product or service attribute, such as quality¹. Here are important keywords as fixed costs, production and service. Historically, capacity cost has been treated as meaningful territory in comparison to variable cost. Capacity cost is known as to maintain at suitable level of productive capacity. It is said that when organizations have unused capacity (of committed resources) they often attempt to get customers to shift their demands. The result of the excess costs attributable to idle or unused capacity is to increase the organization's costs². Here is clearly contained managerial handling for capacity cost. Also CAM-I (Consortium for Advanced Manufacturing–International) approaches that productive capacity is to provides value to the customer—it results in the delivery of good products or service to the market³. And it concludes that rated capacity means “idle capacity + nonproductive + productive”.

These development of capacity theories depicts the following points.

- Resource capability
- Baseline capacity measures
- Capacity utilization measures
- Time frame of analysis
- Organizational focus or strategy⁴

Among these points capacity cost has some strong relations on ‘the baseline capacity measures’ and ‘capacity deployment’. Baseline capacity measures (see Figure 1) mean theoretical capacity, practical capacity, normal capacity, budgeted capacity and actual capacity.

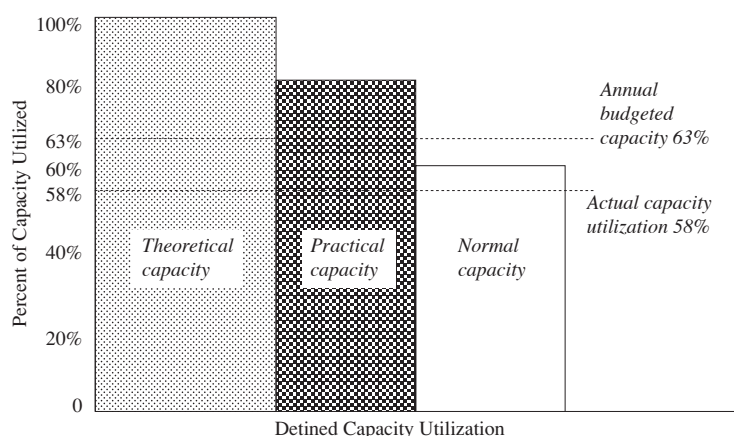
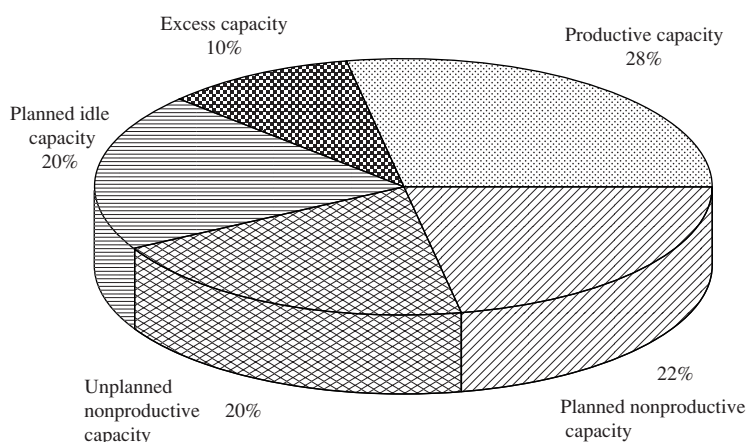
Capacity deployment (see Figure 2) consists of excess capacity, planned idle capacity, unplanned idle capacity, planned nonproductive capacity and productive capacity. Traditionally, fixed cost mentioned above is an example of total capacity cost expressing capacity deployment. Productive capacity here adapts marketable

1 Horngren, C. T. et al.(2005), *Introduction to management accounting*, 13th ed.

2 Kaplan, R. S. et al. (1998), *Advanced Management Accounting*, 3rd ed.

3 McNair, C. J. et al. (1996), *Measuring the Cost of Capacity*, SMA 4Y.

4 McNair, C. J. et al. (1998), *Total Capacity Management*, FAR.

Figure 1 Baseline Definitions of Capacity⁵Figure 2 Capacity Deployment⁶

concepts or suitable for customers' demands.

Historical background

Development of capacity costing has not passed so long time and has experienced critical debates. For over sixty years of capacity and capacity cost has been deemed as hidden resources. Emergence for managerial use on capacity cost would be beginning from the era of direct costing and business budget⁷. Making a clear realization for capacity cost on treatment product costing confined to the development of standard cost⁸.

⁵ *Ibid.*

⁶ *Ibid.*

⁷ Tsuji Atsuo. (1971), *Kanrikaikei hattatsushiron*.

Kobayashi Kengo. (1981), *Genkakeisan Hattatsushi*.

Garner, P. (1954), *Evolution of Cost Accounting to 1925*.

Product costing problem indeed has so fruitful accomplishments on managerial using of costing. Among others proper overhead distribution is the central idea of this era. These areas are summarized as follows.

- Overhead absorption methods(1875–1900) :

Association of overheads with jobs by the addition to each job's prime costs of a flat percentage of its labor cost or prime cost. The percentage would be determined by the relationships between total overheads and total labor cost of the previous year

A crude form of machine hour rate was also in use in this period, but only to absorb expenses directly connected with the machine

Separate departmental rates might apply, but the idea of cost centers or production centers was not prevalent.

- Production centers

Recognition of the factory or workshop as consisting of a number of production centers. From this idea was developed a more refined machine hour rate.

- Overhead analysis

Recognition of the distinction between works overheads and general overheads, and the breakdown of works overheads into different classes.

- Relationship of overheads to capacity

From this relationship was developed the idea of a normal cost in preference to an actual cost. The normal cost concept in turn prepared the way for that of the standard cost⁹.

The final area listed above are focusing on capacity cost and its management. Standard cost has two aspects. One is exact product costing through proper distribution, and the other is the control device for productive work. At this site, periodical cost estimate, in particular, budgeted production capacity. If these capacity estimates would not match with actual production volume, differences should be charged to either product or periodical revenue.

During the early periods of development, the most excellent works was established by Gantt¹⁰ and Church¹¹. Gantt's theory on proper treatment of expense burden focuses to exclude idle capacity cost from product cost.

8 Wada Junzo. (1985).kanrikaikēi no Seiseihatten : Tsuji Atsuo ed. *Kanrikaikēi no Kisoriron*.

9 Hart, Harold. (1976), *An Examination of Developments in Some Critical Areas of Management Accounting with Particular Reference to Overhead Costs*.

10 Gantt, H. L. (1915), "The Relation Between Production and Costs," *American Machinist*.

Church has another opinion to treat idle capacity with control report which has conjunction to supplementary rate.

The subsequent period throughout the 1920s was characterized by debates on the difference between engineering and accounting standard. Mainly two groups make fierce arguments around normal concept at some annual meetings of the NACA (National Association of Cost Accountant). Normal concept means one of the baseline capacity measurement, interlevel between budgeted and actual one. Remained difference is charged directly to the profit and loss statement¹². Capacity management relies on the excess from potential performance of to actual performance. This phenomenon comes from the economic recession in the U.S. at those days. In other words, over capacity and excess productive power are identified as the cause.

Development of business budgeting¹³ has thrown light at peculiar aspects on capacity cost. Passing through the 1930s profit planning and control system have made advance in this area. Its object places at the reasonable adjustment among entire business components. Here is no control problem on productive capacity, however, involvement of every non-productive forces¹⁴. Kobayashi(1981) says ‘The era of setting sun on debates for the capacity cost=fixed cost has begun from now’.

The Present State of Capacity Cost Management and Theory

McNair(1998) points that the reemergence and proliferation of capacity cost management models appear to be logical outgrowths of the renewed interest in cost models¹⁵. And the CAM-I presents the diversity of issues and approaches that make up modern capacity cost management practice(see Table1, Table2). CAM-I and IMA (Institute of Management Accountants) make clear the following points.

- Capacity cost management appears to mean more than measuring and directing short-term capacity utilization.
- Estimated cost of capacity under different levels of utilization
- Capacity issues and objectives in the short, intermediate and long term
- Capacity issues and objectives at different organizational levels (i.e., process, unit, company, and total value chain)
- Analysis and choice of appropriate capacity cost management tools given the existing company strategy and core objectives
- Analysis and improvement in actual capacity utilization¹⁸

11 Church, A. H. (1901), “The proper distribution of established charges,” *The Engineering Magazine*.

12 Wada Junzo. (1991), “Seizokansetuhi ni Kansuru Oboegaki” *Okayama Economic Review*.

13 McKinsey, J. O. (1922), *Budgetary Control* Harrison, G. C. (1930), *Standard Costs—Installation, operation and use*.

14 Kobayshi Kengo. (1987), *Yosankanri Hattatsushi*.

15 *op. cit.*

Table 1. Capacity Cost management Models¹⁶

Model \ Features	Primary Time Frame	Organizational Level	Capacity Baseline Emphasized	Suggested Treatment of Idle Capacity Costs	Primary Focus of Model
Gantt idleness charts	Short-term	Process	Practical	Charge to P&L	Efficiency / utilization
Supplemental rate method	Short-term	Process / plant	Practical	Charge to product	Idle capacity costs
Normalized cost	Intermediate	Process / plant	Normal	Charge to P&L	Decision analysis
Theory of constraints	Short to intermediate	Process / plant / company	Practical (marketable)	None suggested	Throughput
Mix-adjusted model	Short-term	Process / plant	Theoretical	Charge to P&L	Throughput
Resource effectiveness model	Short-to-long-term	Process / plant / company	Theoretical	Charge to P&L	Resource utilization
Capacity utilization analysis	Short to intermediate	Process / plant / company	Theoretical	Charge to P&L	Resource utilization
Capacity variance model	Short to intermediate	Process / plant	Theoretical	None suggested	Causality / analysis
Activity-based cost model	Short to intermediate	Process / plant / company	Normal	Charge to P&L	cost of resources used
CAM-I model	Short to long-term	All levels (potential)	Theoretical	Charge to P&L	Communication
CUBES model	Short to intermediate	Process / plant / company	Theoretical	None suggested	Process utilization
Cost containment model	Intermediate	All levels (potential)	Implicit theoretical	None suggested	Total cost / resources

Table 2. CAM-I Capacity Model¹⁷

Rated Capacity	Summary Model	Industry Specific Model	Strategy Specific Model	Traditional Model
Rated Capacity	idle	Not Marketable	Excess Not Usable	Theoretical
		Off Limits	Management Policy	
			Contractual	
			Legal	
	Non-productive	Marketable	Idle But Usable	Practical
		Stand by	Process Balance	Scheduled
			Variability	
		Waste	Scrap	
			Rework	
			Yield Loss	
		Maintenance	Scheduled	
			Unscheduled	
		Setups	Time	
			Volume	
			Change-Over	
	Productive	Process Development		
		Product Development		
		Good Products		

16 *Ibid.*17 *Ibid.*

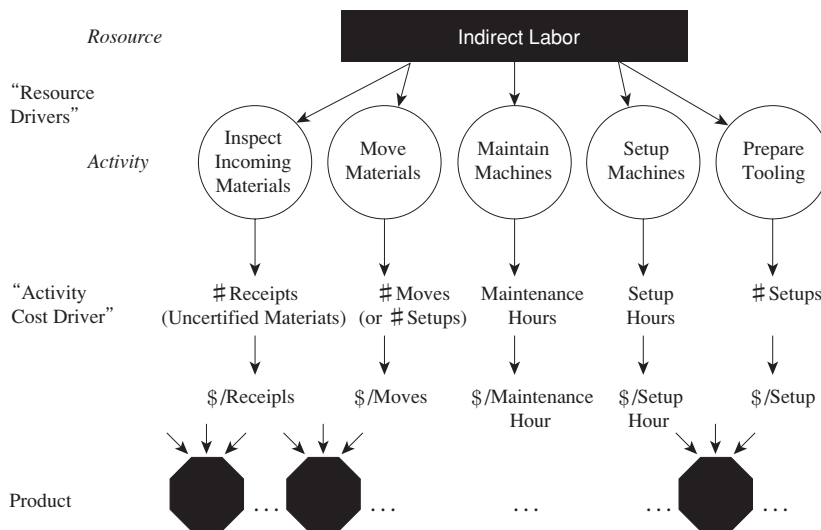


Figure 3. ABC System : Expenses Flow from Resource to Activities to Products¹⁹

These are reflected in some changing aspect of company resources and its use. Priority of issues should be placed upon value-creation management beyond mere measurement of capacity utilization.

ABC model

ABC (Activity Based Costing) had its completion by the work of R. S. Kaplan and R. Cooper in the 1990s. ABC model has a simple equation that is activity availability = activity usage + unused capacity. Unused Capacity means the gap between what could have been done and the work actually accomplished, stated in financial terms. The basic structure (see Figure 3) of ABC consists from two concepts, Resource and Cost Driver. They do identify the differences between value-creating consumption and non-value-consumption of resources. Traditional capacity costing and measurement have denoted multiple cost drivers and clear distinction on profitable consumption of capacity.

ABC model is typically the technique of many allocation methods on overhead, however, its information implies which optimal capacity decision which is needed. Especially, ABM (Activity Based Management) can be installed with ABC makes more useful capacity management information for management²⁰.

JIT Model and Kaizen Costing

JIT (Just In Time) from Japanese management has acquired its explosive acceptance through the 1970s and 80s. JIT works with TQM (Total Quality Management), which has concentrated on eliminating errors and defects from the workflow, and which has focused on eliminating move and queue from operations²¹. JIT model

18 *Ibid.*

19 Kooper, R. and Kplan, R. S. (1999), *The Design of Cost Management System*.

20 Kaplan, R. S. and Cooper, R. (1997), *Cost & Effect*.

Table 3. Comparison of JIT and Traditional Manufacturing²²

<i>JIT</i>	<i>Traditional</i>
1. Pull, or Kanban system	1. Push system
2. Insignificant or zero inventories	2. Significant inventories
3. Manufacturing cells	3. "Process" structure
4. Multifunction labor	4. Specialized labor
5. Total quality control (TQC)	5. Acceptable quality level
6. Decentralized services	6. Centralized serves
7. Simple cost accounting	7. Complex cost accounting

Tabel 4. Traceability of Product Cost : Traditional versus JIT Manufacturing²³

	<i>Traditional</i>	<i>JIT</i>
Direct labor	Direct	Direct
Direct materials	Direct	Direct
Material handling	Indirect	Direct
Repairs and maintenance	Indirect	Direct
Energy	Indirect	Direct
Operating supplies	Indirect	Direct
Supervision	Indirect	Direct
Insurance and taxes	Indirect	Indirect
Building depreciation	Indirect	Indirect
Equipment depreciation	Indirect	Direct
Building occupancy	Indirect	Indirect
Product support services	Indirect	Indirect
Cafeteria services	Indirect	Indirect

(see Table 3) incorporates some unique aspects against traditional manufacturing process. Measurement of capacity utilization with JIT is similar in structure to ABC system (see Table 4). In JIT system many indirect costs are converted to direct one. From the capacity management view, it's more easier to analyze on utilization that the specific product / service has the conversion into direct costs from indirect one. And flexibility in the production can be estimated in advance.

Kaizen Costing has derived from JIT model, is the term for continuous improvement during manufacturing. Kaizen costing may allow the firm to achieve target cost over the product's life²⁴. JIT model also provides a yardstick for performance measurement. These information may mitigate to handle with complicated cost figures. (see Table 5)

21 McNair. (1998).

22 Shim, J. K. eds. (1997) Corporate Controller's Handbook of Financial management 2nd ed.

23 *Ibid.*

24 Horngren. (2005).

Table 5. Performance Measures—Traditional versus JIT²⁵

<i>Traditional</i>	<i>JIT</i>
Direct labor efficiency	Total head cout productivity
Direct labor utilization	Returen on asserts
Direct labor productivity	Days of inventory
Machine utilization	Group incentives
	Lead time by product
	Response time to customer feedback
	Number of customer complaints
	Cost of quality
	Setup reduction

TOC and Backflush costing

TOC (Theory of Constraints)²⁶ advocates strongly exclusions of any capacity costs from products. Three factors, which are throughput, operating expense and inventory, play important roles. TOC measures profit= throughput– operating expenses. Also throughput measures the difference between revenues and cost of raw materials. In the TOC, capacity cost should be used to create customer value. If all the company resources are not matched with the throughput the company creates, inefficient use of the capacity in the various business processes can mean low or nonexistent profits. In that meaning, TOC may target its profit as added value.

Backflush costing is a costing system that omits recording some or all of the journal entries relating to the cycle from purchase of direct materials to the sale of finished goods. The type of backflush costing can treat profit from the sale of finishing goods²⁷.

Conclusion

The development of capacity cost management has long history. The first commitment to the capacity is costing idle or excess capacity. Proper allocation of indirect cost on products indeed was focused to prepare profit and loss report. Although A.H. Church discovered efficiency standard of capacity utilization as supplementary rate for managerial use, dominant opinions and practices were directed to solution for overhead allocation. Solutions for capacity costing problem still remained at result–based approach.

The development of standard costing and budgeting is the second one for the capacity costs. Importance of capacity utilization has discovered as the great consequence to determinate product cost and business profit. There was no theoretical distinction between productive and non–productive consumption of capacity, however the object for analysis was changing from physical to both of physical and non–physical asset.

Capacity–related resources are acquired and paid for in advance when the work is done. The transition from

²⁵ Shim (1997).

²⁶ Goldratt, E., and J. Cox. (1986), *The Goal*.

Goldratt, E. (1990) *Theory of Constraints*.

²⁷ Horngren, C. T. et al. (2000) *Cost Accounting*.

cost assignment to cost control for capacity has been seemed to be seamless. Three issues remains. The first is to measure utilization of existing capacity as service potentials, the second is the conversion to value-based approach and the third is managerial treatment of nonphysical capacity. ABC, TOC and JIT models might give some alternative suggestions for constructing useful framework for management accounting.

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Capacity management has one of the most important issues for management accounting and cost management. It has huge accumulation of theoretical and empirical research through the 20th century. In other words, there remain many inextricable disputes on capacity management. Turning to the real business world, we must solve a variety of challenges from strategic mixture of company resources and measurement for their components. Now, capacity is the value-creating ability of an organization. Its ability comes from proper shapes of capacity and cost management system.

This paper shows that measurement concept and techniques for capacity costing from historical background are mainly focusing on physical asset. Adding to that, central issue has been around the distribution of unused capacity cost to products. Today's view of capacity cost management is reinforced to notify forward-looking not retrospective. In this meaning, this paper addresses that capacity cost management should provide supportive instruments in current and future utilization of capacity including nonphysical asset.